

## CLAIMS

1. A renal replacement therapy system, comprising:
  - a blood treatment device;
  - a first panel comprising first and second sheets of material sealed to form a first fluid pathway and a first chamber, the first fluid pathway passing a volume of a waste fluid to the first chamber, the first fluid pathway and first chamber free of an air interface;
  - a second panel comprising first and second sheets of material sealed to form a second fluid pathway and a second chamber, the second fluid pathway passing a volume of a replacement fluid to the second chamber, the second fluid pathway and second chamber free of an air interface, wherein the first and second panels are arranged in overlapping fashion and aligned so that the first chamber overlays the second chamber to form a structure so that the first fluid from the first chamber is displaced as the second fluid fills the second chamber;
  - a sensor operatively associated with at least one of the first or second panels to measure fluid pressure in the first or second fluid pathway; and
  - an extracorporeal circuit for circulating blood from an individual through the blood treatment device to remove waste and to return blood and replacement fluid to the individual after removal of waste while the first and second panels operate to balance the volume of removed waste fluid with the volume of replacement fluid.

2. A system according to claim 1

wherein the flexible panel includes two flexible sheets having a pattern of seals forming the flow channel and in-line sensor region between the two flexible sheets.

**3. A system according to claim 1**

wherein the flexible panel includes an in-line pump region to convey fluid in the flow channel in response to peristaltic pressure externally applied to the flexible panel.

**4. A system according to claim 3**

wherein the in-line sensor region is located in an upstream flow direction from the in-line pump region.

**5. A system according to claim 3**

wherein the in-line sensor region is located in a downstream flow direction from the in-line pump region.

**6. A system according to claim 1**

wherein the flexible panel includes a clamping region to occlude the flow channel in response to force externally applied to the flexible panel.

**7. A system according to claim 1**

wherein the flow channel conveys waste from the blood treatment device.

**8. A system according to claim 1**

wherein the flow channel conveys replacement fluid for return to the individual.

9. A method for renal replacement therapy of a patient's blood, comprising the steps of:  
providing an extracorporeal fluid circuit comprising a blood treatment device, a first panel comprising first and second sheets of material sealed to form a first fluid pathway and a first chamber, the first fluid pathway and first chamber free of an air interface, and a second panel comprising first and second sheets of material sealed to form a second fluid pathway and a second chamber, the second fluid pathway and second chamber free of an air interface, wherein the first and second panels are arranged in overlapping fashion and aligned so that the first chamber overlays the second chamber;

attaching the patient to the extracorporeal fluid circuit to access the patient's blood;

circulating blood from the patient through the blood treatment device to remove waste and to return blood and replacement fluid to the patient after removal of waste while the first and second panels operate to balance the volume of removed waste fluid with the volume of replacement fluid; and

measuring fluid pressure in the first or second fluid pathway using a sensor operatively associated with at least one of the first or second panels.

10. A method according to claim 9

including the step of pumping fluid in the flow channel by externally applying peristaltic pressure to the flexible panel.

11. A method according to claim 10

wherein the sensing step senses fluid pressure downstream of where peristaltic pressure is applied.

12. A method according to claim 10

wherein the sensing step senses fluid pressure upstream of where peristaltic pressure is applied.

13. A method according to claim 9

including the step of occluding the flow channel by externally applying force to the flexible panel.

14. A method according to claim 9

wherein the flow channel conveys waste from the blood treatment device.

15. A method according to claim 9

wherein the flow channel conveys replacement fluid for return to the individual.

16. A renal replacement therapy system, comprising:

a blood treatment device having a pressure sensor region;

a fluid circuit;

said fluid circuit including at least one member defined by at least one flexible panel wall;

said fluid circuit being configured to be engaged by said blood treatment device

including engaging a portion of said at least one flexible panel wall by said pressure sensor region such that a pressure within said at least one member is measurable when said fluid circuit is engaged by said blood treatment device;

said pressure sensor region remaining outside said at least one member such that no fluid-air interface is required;

said fluid circuit including a treatment filter portion a sterile portion including a venous line adapted for conveying blood to a patient from said treatment filter portion and from an arterial portion adapted for conveying blood from a patient to a treatment filter portion; said pressure sensor region being located to indicate one of a pressure of a venous pressure, an arterial pressure, and a pressure of blood at said treatment filter portion.